Road Environmental Design from Filed Study of "Shared Space"

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ABSTRACT

In recent years, certain results of the safety and comfort of shared space have also been provided. In this research, we reanalyzed 10 cases of shared space of previous research. In the meantime, we also conducted field investigation of 5 cases of shared space and similar shared space in Japan, and conducted comparative study on the shared space both in Japan and abroad. We found that due to lack of instruction from signs and traffic light in the shared space, it will strengthen eye contact between pedestrians and users of vehicles, which can reduce the speed of vehicles. Secondly, the shared space at current stage is not completely shared, and some traditional measures are still used to limit the speed, such as the speed bumps, etc. In addition, the design of each segment of shared space should be consistent with the actual transportation situation of city. Last but not the least, by removing the signs, it can truly improve the comfort and strengthen the security of space. Based on the cases in Japan, we found that it could increase the comfort of road, and it was easier for pedestrians to pass by. Therefore, there is certain possibility to implement shared space in Japan.

1. INTRODUCTION

"Shared Space" is a new approach to design public space, where traffic no longer dominates, but other functions, such as pedestrian and bicycle, are equal to vehicles. By reviewing various meanings of signs, H. Monderman (Monderman Hasns, 2006) pointed out the fact that the quality of landscape significantly affects the human behavior. He also believed that it is important to create an environment that relies on independent judgment rather than regulation or prohibition. It is a matter of human dignity and sign planning of higher level. He participated in more than 100 projects of road safety and community development. Since then, his idea of "Shared Space" has been implemented in environmental design of roads around the world.

From the actual road situation in Japan, the vehicles have the priority to pass according to the traffic rules, and accidents tend to occur in the area with both pedestrians and vehicles. Based on this status quo, in order to further verify the feasibility to implement the shared space that lets pedestrians pass first in Japan, in this research, we reanalyzed 10 cases of shared space of previous research. In the meantime, we conducted field investigation of 5 cases of shard space and similar shared space in Japan for comparison. Through investigation of the status quo of shared space overseas, we summarized the methods to improve traffic in shared space and the approaches to design shared space, and we also discussed the measures that can be implemented in Japan according to the status quo of Japan. Secondly, based on the implemented cases in Japan and similar cases, we analyzed and summarized the areas that could implement shared space in Japan. According to the analysis of previous researches and domestic field survey result in Japan, we discussed the possibility to implement shared space in Japan.

2. METHOD

In 2011, Yamamoto *et al.* (Yamamoto *et al.*, 2011) and Nishikawa *et al.(* Nishikawa *et al.,* 2011) conducted field investigation in 10 locations, including Oudehask, Drachten in Netherlands, London in England, etc. In this research, we reanalyzed the field investigation data of those 10 areas, and further summarized the experimental methods for shared space.

In the researches on shared space and similar shared space in Japan, we reanalyzed the social experiment of shared space in Kyoto conducted in 2011. In the meantime, we investigated the implementation status quo of shared space in Sanjyo Dori of Kyoto in 2013. Furthermore, we conducted field investigation in similar shared space in Tottori, Izumo and Wajima(table 1). During the investigation, we took pictures of the actual space, and investigated various design elements adopted in the space.

Table 1: Research Object of Shared Space in Japan

City	Street attributes	Year of Field Research
Kyoto(sanjyo dori)	Shared Space	2016
Tottori(shikano machi)	Similar Shared Space	2017
Izumo(shinmon dori)	Similar Shared Space	2017
Wajima(asaichi dori)	Similar Shared Space	2018
Wajima(monzen machi)	Similar Shared Space	2018

3. REANALYSIS OF PREVIOUSS RESEARCHES AND FIELD RESEARCH

First of all, we investigated the effectiveness of shared space based on the implementation approach for shared space and the comparison before and after the implementation in ouverseas shared space. According to the researches of Yamamoto and Nishikawa *et al.*(2011), we can see that at the intersection of shared space in those places, the space was mainly constructed through the methods of plants, fountain, pavement design, etc. On the Kensington High Street of London, more than 90% of the traffic lights were removed, and the shared space was mainly constructed through the method of pavement design. Similarly, in areas such as Oudehaske, Bohmte and Ashford, the shared space was mainly constructed through pavement design.

In Japan, the experiment of shared space was initially conducted in Higashinotoin-dori between Shijyo and Bukkoji dori, Kyoto. The shared space was realized by removing the traffic light and designing the road pavement. The experimental results show that after implementing shared space, the vehicle speed in this area had significant decline(Toyoshige *et al.,* 2011). In other words, the use of shared space could effectively control the vehicle speed. For the pedestrians, wider road was more friendly and beneficial to them.

In addition to the social experiments, the first street to implement shared space in Japan was Sanjyo Dori of Kyoto. On the Sanjyo Dori, the traffic lights within around 900m scope between Karasuma Dori and Kawaracho Dori were removed, and the space shared by pedestrians and vehicles was mainly constructed through pavement design. According to the

implementation results, we can see that as the road became wider, it was more convenient for pedestrians to move, while the vehicle speed was limited under 20km/h.

As shown in Fig.1, in Wajima, there was be seafood market before 12:00 A.M., and vehicles were forbidden to pass before that time. There was no traffic light in the joint between this section and external streets, and the movement direction of pedestrians and vehicles was mainly controlled through the pavement design. Two sections were divided on each side of road by using different materials and colors of pavement. Before 12:00 A.M., vendors were allowed to display their products in these areas; after 12:00 A.M., they were used as sidewalks.

a: Before 12:00 A.M. b: After 12:00 A.M.

Figure 1: Similar Shared Space of Asaichi Dori(Honmachi Dori) in Wajima

Similar cases of shares space also include the road before Sojiji Temple in Wajima named Monzen Machi, and the roads of Shinmon Dori in Izumo(Fig.2). For tourist attractions, pavement design was conducted to the road before the attraction. The pedestrians and vehicles were guided through pavement design. Even though it could not become a complete shared space, it could still experience the possibility of shared through its design method.

a: Monzen Machi b: Shinmon Dori

Figure 2: Similar Shared Space of Monzen Machi in Wajima and Shinmon Dori in Izumo

4. RESULTS AND DISCUSSION

We conducted specific analysis of various cases both overseas and in Japan. According to the results of field investigation, we can see that after using the shared space, it will strengthen eye contact between pedestrians and users of vehicles, it could inhibit the speed of vehicles, and prioritize the movement of pedestrians. Secondly, the shared space at current stage is not completely shared such as similar shared space in Wajima, Izumo etc., and some traditional measures are still used to limit the speed, such as the speed bumps, etc. Similarly,

it can be clarified that the shared space was implemented mainly through the method of vehicle access, road surface design, street furniture setting and many other methods. Then, by removing signs on both sides of road and the traffic light, the space between pedestrian and vehicle became wider, which could improve the spatial comfort of street. Last but not the least, even in different countries and cities, shared space could reduce signs and allow pedestrians, automated cars and bicycles to coexist. However, the design of each segment of shared space should be consistent with the actual transportation situation of city.

According to the field research conducted in Kyoto, we can see that Japan has achieved similar results in shared space and similar shared space with Europe, such as inhibiting the vehicle speed, improving the road comfort, etc. According to the actual cases, there is high possibility to implement shared space in Japan. In particular, in areas which require pedestrian priority, such as tourist attractions, a hill/a sloping road and mountainous area, the shared space should be promoted people's activities, increased the activity of the street and recommended to strengthen the security of traffic.

In Ozaki's experiment conducted in 2017, the results showed that different pavement design had certain influence on vehicle speed, and when the pavement had the design pattern of rhombus, the driving speed was the slowest(Ozaki *et al.* 2017). However, as for the implementation of shared space, further verification is required through comparison with other street furniture. Then, Japan has not fully implemented shared space at present. Therefore, in addition to the possibility of implementation, efforts should also be made to strengthen the safety awareness of both pedestrians and drivers. In addition, there are many approaches to design shared space, while in Japan, it is mainly set through road pavement. Other approaches require further discussion.

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